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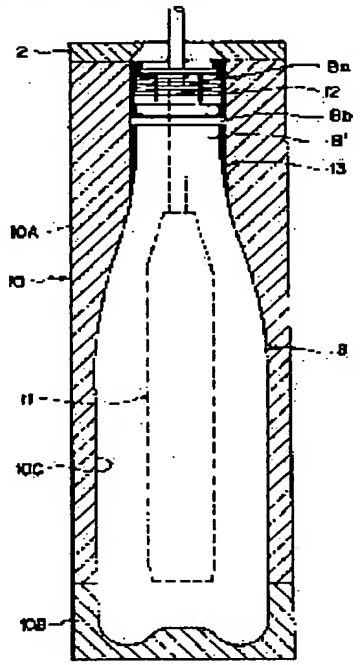
(54) DEVICE AND METHOD FOR PRODUCING CARBON FILM-COATED PLASTIC CONTAINER

(57)Abstract:
PROBLEM TO BE SOLVED: To coat even a container having a protrusion directed outward from its outer surface without any spot at the time of forming a hard-carbon coating film on the inner wall face of the plastic container.
SOLUTION: A plastic container B is placed in the vacuum chamber 10C of an external electrode 10, and a hard-carbon film is formed on the inner wall face of the container by the plasma produced between the external electrode and an internal electrode 11 inserted in the container B. In this case, intervening rings 12 and 13 with their inner wall face having almost the same shape as the external shape of the mouth B' of the container B on which a support ring Bb is formed are attached to the mouth B', the rings 12 and 13 and the container B together are put in the vacuum chamber 10C of the external electrode 10, and the gap between the inner wall face of the vacuum chamber 10C and the periphery of the container B is filled up.



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CLAIMS

[Claim(s)]
[Claim 1] A container is mostly held in the vacuum chamber of an analog with the appearance of the container formed in the external electrode. While inserting an internal electrode into the container held in the vacuum chamber of this external electrode and making a vacuum chamber into a vacuum, after supplying the material gas of a carbon source in a container, In the manufacturing installation of the carbon film coating plastic envelope which forms the hard carbon film in the internal surface of a container by generating the plasma between an external electrode and an internal electrode It is formed in the configuration which holds the container which has the lobe to which the internal surface of the vacuum chamber of said external electrode projects in the method of outside from a peripheral face. It has the infixation member which has the conductivity held in the vacuum chamber of said external electrode while covering the part of this container in which the lobe is formed at least by having the appearance of the container which has said lobe, and the internal surface mostly formed in the same configuration, and equipping a container and the container had been equipped. In the dead air space formed by holding the container which has a lobe between the internal surface of the vacuum chamber of said external electrode, and the peripheral face of the container held in this vacuum chamber The manufacturing installation of the carbon film coating plastic envelope characterized by what said infixation member with which a container is equipped, and which is held in a vacuum chamber with this container is infixed for.
[Claim 2] The manufacturing installation of the carbon film coating plastic envelope according to claim 1 held after the peripheral face has been mostly contacted by the internal surface of a vacuum chamber when a container is equipped and it holds in the vacuum chamber of said external electrode, while covering the peripheral face of the part in which the container which has the lobe which projects in the method of the outside of the direction of a path from a peripheral face is equipped with said infixation member, and the lobe of this container is formed.
[Claim 3] Said infixation member consists of two parts, the part with which an upper part part is equipped rather than the lobe of the flange configuration which projects in the method of the outside of the direction of a path from the peripheral face of the regio oralis of a container, and the part with which a lower part part is equipped. The manufacturing installation of the carbon film coating plastic envelope according to claim 2 with which a peripheral face becomes almost flat-tapped with the peripheral face of a lobe when two parts of this infixation member are formed so that that outer diameter may become almost the same as that of the outer diameter of a lobe, respectively, and the regio oralis of a container is equipped with them on both sides of a lobe.
[Claim 4] The manufacturing installation of the carbon film coating plastic envelope according to claim 1 which said infixation member is mostly formed in the same configuration with the appearance of the container which has the lobe to which that internal surface projects in the method of the outside of the direction of a path from a peripheral face, holds a container in the interior, and is held in the vacuum chamber of said external electrode with this held container.
[Claim 5] A container is mostly held in the vacuum chamber of an analog with the appearance of the container formed in the external electrode. While inserting an internal electrode into the container held in the vacuum chamber of this external electrode and making a vacuum chamber into a vacuum, after supplying the material gas of a carbon source in a container, In the manufacturing installation of the carbon film coating plastic envelope which forms the hard carbon film in the internal surface of a container by generating the plasma between an external electrode and an internal electrode Said external electrode is divided into two or more parts, and a vacuum chamber is formed by being attached where two or more of these divided parts of each other are insulated by the insulating member. The manufacturing installation of the carbon film coating plastic envelope characterized by connecting an RF generator to each of a part by which this external electrode was divided, and supplying power to each part of an external electrode according to an individual.
[Claim 6] The manufacturing installation of the carbon film coating plastic envelope according to claim 5 with which said external electrode is divided into two parts of the part which holds the part, shoulder, and regio oralis

which hold the drum section of a bottle.
[Claim 7] It is formed in the configuration which holds the container which has the lobe to which the internal surface of the vacuum chamber of the external electrode which consists of several two or more parts projects in the method of outside from a peripheral face. It has the infixation member which has the conductivity held in the vacuum chamber of said external electrode while covering the part of this container in which the lobe is formed at least by having the appearance of the container which has said lobe, and the internal surface mostly formed in the same configuration, and equipping a container and the container had been equipped. In the dead air space formed by holding said excrescence between the internal surface of the vacuum chamber of said external electrode, and the peripheral face of the container held in this vacuum chamber The manufacturing installation of the carbon film coating plastic envelope according to claim 5 with which said infixation member with which a container is equipped, and which is held in a vacuum chamber with this container is infixed.
[Claim 8] The manufacturing installation of the carbon film coating plastic envelope according to claim 5 connected to the part into which the external electrode with which it has the RF generator of the number of parts with which said external electrode was divided, and the same number, and each RF generator corresponds, respectively was divided.
[Claim 9] The manufacturing installation of the carbon film coating plastic envelope [equipped with the RF generator of a piece] according to claim 5 by which this RF generator is connected to each part into which said external electrode was divided through the circuit changing switch.
[Claim 10] The manufacturing installation of the carbon film coating plastic envelope according to claim 1 or 5 with which the inspection hole which can check the inside of a vacuum chamber by looking through the heat resisting glass attached in this external electrode is prepared in the part of the arbitration of the wall of said external electrode.
[Claim 11] A container is mostly held in the vacuum chamber of an analog with the appearance of the container formed in the external electrode. While inserting an internal electrode into the container held in the vacuum chamber of this external electrode and making a vacuum chamber into a vacuum, after supplying the material gas of a carbon source in a container, In the manufacture approach of the carbon film coating plastic envelope which forms the hard carbon film in the internal surface of a container by generating the plasma between an external electrode and an internal electrode Equip the external surface of a container with the conductive infixation member which has the appearance of the container which has the lobe which projects in the method of outside from a peripheral face, and the internal surface mostly formed in the same configuration, and the part of this container in which the lobe is formed at least is covered. The container with which it was equipped with the infixation member in the vacuum chamber of the external electrode currently formed in the configuration which holds the container which has a lobe is held with an infixation member. The manufacture approach of the carbon film coating plastic envelope characterized by infixing an infixation member into the dead air space formed by holding the container which has a lobe between the internal surface of the vacuum chamber of an external electrode, and the peripheral face of the container held in this vacuum chamber.
[Claim 12] The part in which the external surface of a part in which the lobe of a container is formed is equipped with the configuration of a container of having the lobe to which an internal surface projects in the method of the outside of the direction of a path from a peripheral face, and the infixation member mostly formed in the same configuration, and the lobe of this container is formed is covered. The infixation member with which this container was equipped is held in the vacuum chamber of an external electrode with a container. The manufacture approach of the carbon film coating plastic envelope according to claim 11 infixed into the dead air space formed by holding the container which has a lobe between the internal surface of the vacuum chamber of an external electrode, and the peripheral face of the container held in this vacuum chamber.
[Claim 13] The manufacture approach of a carbon film coating plastic envelope according to claim 11 of holding the infixation member in which the container was held in the appearance of the container which has the lobe which projects in the method of the outside of the direction of a path from a peripheral face, and the infixation member mostly formed in the same configuration, and the internal surface covered the peripheral face of a container and held this container in the vacuum chamber of the external electrode formed in the almost same configuration as the appearance of an infixation member.
[Claim 14] A container is mostly held in the vacuum chamber of an analog with the appearance of the container formed in the external electrode. While inserting an internal electrode into the container held in the vacuum chamber of this external electrode and making a vacuum chamber into a vacuum, after supplying the material gas of a carbon source in a container, In the manufacture approach of the carbon film coating plastic envelope which forms the hard carbon film in the internal surface of a container by generating the plasma between an external electrode and an internal electrode An RF generator is connected to each part of said external electrode which forms a vacuum chamber in the interior by being attached where two or more divided parts of each other are insulated by the insulating member, respectively. The manufacture approach of the carbon film coating plastic

envelope characterized by switching on power according to an individual at each part which forms the vacuum chamber of an external electrode.

[Claim 15] The manufacture approach of the carbon film coating plastic envelope according to claim 14 which connects the RF generator of the number of parts with which said external electrode was divided, and the same number to the part into which the corresponding external electrode was divided, respectively.

[Claim 16] The manufacture approach of the carbon film coating plastic envelope according to claim 14 which connects the RF generator of a piece to each part into which said external electrode was divided through a circuit changing switch.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the manufacturing installation and the manufacture approach of manufacturing the returnable container made from plastics.
[0002]
[Problem(s) to be Solved by the Invention] Generally, the container made from plastics is widely used as a restoration container in the field with the various food fields, drugs fields, etc. from various properties, such as a point that shaping is an easy point, a lightweight point, and low cost.
[0003] However, since plastics has the property to make low-molecular gas, such as oxygen and a carbon dioxide, penetrate, and the property (property which absorbs a low-molecular organic compound during the presentation of plastics) to sorb a low-molecular organic compound as known well, the container fabricated by this plastics receives constraint with those various use gestalten for use compared with other containers fabricated with glass etc.
[0004] For example, since the carbonated drink with which it fills up since oxygen penetrates plastics and permeates the interior of a container oxidizes with time, and carbon dioxide gas penetrates plastics, and is emitted to the exterior of a container and the mind of a carbonated drink falls out in using this plastic envelope as a restoration container of carbonated drinks, such as Biel, the plastic envelope is not used as a restoration container of a carbonated drink.
[0005] Moreover, since the sorption of the aroma components (for example, limonene of orange juice etc.) which are the low-molecular organic compounds contained in a drink is carried out to plastics when using this plastic envelope as a restoration container of the drink which has aroma components, such as orange juice, the balance of a presentation of the aroma component of a drink collapses and the quality of that drink deteriorates, the plastic envelope is not used as a restoration container of the drink which has an aroma component.
[0006] Moreover, since there is a possibility of beginning to melt into the matter (especially liquid) with which it fills up with low molecular weight compounds, such as a plasticizer contained during the plastics presentation and an additive of a residual monomer and others, and spoiling the purity of the matter, the plastic envelope is not used as a restoration container of matter with which especially purity is required.
[0007] When it is left by the plastic envelope in an environment in the case of recovery unlike [although recent years especially come on the other hand, recycle-ization of a resource comes to be cried for and recovery of a used container has been a problem, when using a plastic envelope as a returnable container] glassware etc., the sorption of the various low-molecular [mold odor] organic compound will be carried out to plastics between them. And since after washing of a container remains in the presentation of plastics, the low-molecular organic compound by which the sorption was carried out to this plastics is insanitary, and when this plastic envelope is moreover re-filled up with contents, it has a possibility of beginning to melt gradually as heterogeneity and causing the debasement of contents into the contents with which it filled up. For this reason, in the former, the example which uses a plastic envelope as a returnable container was restricted.
[0008] However, since it has properties, such as the ease of shaping, lightweight nature, and low cost nature, as mentioned above, the plastic envelope is very convenient if this plastic envelope can be further used as a returnable container as restoration containers, such as a drink which has a carbonated drink and a flavor component, and a restoration container of the matter with which purity is demanded.
[0009] The applicant of the invention in this application is performing the proposal for using a plastic envelope as a returnable container in the patent application (Japanese Patent Application No. No. 189224 [six to]) performed previously paying attention to the convenience of such a plastic envelope.
[0010] Invention concerning the patent application of the point by the applicant of this invention in this application relates to the equipment which forms the DLC (Diamond Like Carbon) film in the internal surface of a plastic envelope, in order to raise the gas barrier nature of a plastic envelope and to intercept the sorption of

the low-molecular organic compound to a plastic envelope.
[0011] Here, the DLC film is hard ca[redacted] film called i carbon film or the hydro[redacted]tion amorphous carbon film (a-C:H), and is SP3. It is the amorphous [redacted]arbon film which made association the s[redacted]ject, and while it is very hard and excelling in insulation, it has the high refractive index.
[0012] The manufacturing installation of the carbon film coating plastic envelope concerning the patent application of this point manufactures a plastic envelope usable as a returnable container by forming the thin film of this DLC in the internal surface of a plastic envelope, and intercepting transparency of the gas from plastics, and the sorption of the low-molecular organic compound to plastics.
[0013] That is, the manufacturing installation of this carbon film coating plastic envelope is equipped with the electric insulating plate 2 made from a ceramic attached on the pedestal 1, the external electrode 3 attached on this electric insulating plate 2, and the internal electrode 4 inserted into the chamber formed in this external electrode 3 as shown in drawing 14 .
[0014] After this external electrode's 3 constituting a vacuum chamber for the chamber of that inside to perform plasma discharge, inserting plastic envelope B into body section 3A and sealing the inside of a chamber by lid 3B, by the vacuum pump which is not illustrated, air is discharged from an exhaust pipe 5 and the inside of a chamber is made into a vacuum.
[0015] And after blowing off from blow-off hole 4A of an internal electrode 4 and making homogeneity diffuse the material gas supplied from the material gas supply pipe 6 in the chamber of the vacuum of this external electrode 3, power is supplied to the external electrode 3 from RF generator 8 through the adjustment machine 7, and the DLC film is formed in the internal surface of plastic envelope B by generating the plasma between the grounded internal electrodes 4.
[0016] The manufacturing installation of this carbon film coating plastic envelope The chamber of the external electrode 3 is mostly formed in an analog in accordance with the appearance of plastic envelope B, and the appearance of an internal electrode is mostly formed in the analog along with the internal surface of plastic envelope B, and mutual spacing is mostly maintained at homogeneity. Furthermore, when material gas blows off inside plastic envelope B, it is characterized by the ability to form the DLC film only in the internal surface of plastic envelope B.
[0017] And further, since the chamber in the external electrode 3 constitutes a vacuum chamber, the manufacturing installation of this carbon film coating plastic envelope can shorten sharply the purge timing for making this chamber into a vacuum, and has the description of enabling mass production of the returnable container made from plastics by this.
[0018] In addition, in order for plastic envelopes to collide or rub in the selling root in the production process in works when this plastic envelope is used as a returnable container if the DLC film is formed in the external surface of a plastic envelope, formation of the DLC film is limited only to the internal surface of plastic envelope B, and is performed, because there is a possibility of the thin and hard DLC film itself being damaged and spoiling the commodity value of plastic envelope B.
[0019] Here, the plastic envelope is very lightweight compared with the usual returnable containers, such as glass. For this reason, in case a plastic envelope is put on a conveyor, and is conveyed and restoration, capping, etc. of contents are worked, there is a possibility that a container may fall. Moreover, at drink works etc., although it needs to be filled up with the contents to a container at high speed for a productive-efficiency rise, for that, it is necessary to support a lightweight plastic envelope at the time of restoration of contents. Furthermore, since a high pressure is applied in the vertical direction to a container in case it caps after restoration of contents, when the plastic envelope with weak reinforcement does not have a support compared with containers, such as glass, there is a possibility that it may deform or capping may become imperfect.
[0020] Then, as shown in plastic envelope B at drawing 15 , a support ring Bb may be formed in the lower part location of the thread part Ba of the regio oralis. This support ring Bb is the protruding line of the flange configuration which projects in the method of outside from the peripheral face of the regio oralis of plastic envelope B. By sliding, while that lower part is supported with the guide rail with which this support ring Bb was constructed above the conveyor, in case plastic envelope B is conveyed, filled up with and capped The fall of plastic envelope B at the time of conveyance and restoration is prevented, and it responds to the load of the vertical direction further added at the time of capping between guide rails.
[0021] However, if it is going to form the DLC film in plastic envelope B by which the support ring Bb was formed in the above regio oralis by the manufacturing installation of the carbon film coating plastic envelope concerning application of the point shown in drawing 14 Although there can be no clearance between the peripheral face and internal surface of the external electrode 3 about the idiosoma and the shoulder of plastic envelope B when plastic envelope B is held in the external electrode 3 as shown in drawing 16 About the regio oralis, it is unavoidable by forming the support ring Bb between the peripheral face and internal surface of the

external electrode 3 that Clearance s opens.
[0022] For this reason, the DLC film becomes the internal surface of the regio oralis of plastic envelope B which has a support ring Bb is hard to be formed compared with a drum section or a shoulder, and, for this reason, the problem that spots arise in formation of the DLC film to plastic envelope B arises.
[0023] Moreover, since the outer diameter of the thread part Ba formed in regio-oralis B' of plastic envelope B also becomes larger than the outer diameter of other parts of regio-oralis B', a clearance opens between the internal surfaces of the external electrode 3 which hold regio-oralis B' of this plastic envelope B also by this, and the problem that spots arise is in the formed DLC film.
[0024] Moreover, it sets to the manufacturing installation of the carbon film coating plastic envelope concerning application of said point. Since the appearance configuration of the internal electrode 4 inserted into plastic envelope B which performs coating is restrained by the bore of **** of this plastic envelope B When **** of plastic envelope B is thin so that drawing 14 may also show, the direction between a shoulder and the regio oralis may become [spacing between the external electrode 3 and an internal electrode 4] narrow by idiosoma between the shoulder of plastic envelope B to regio oralis.
[0025] For this reason, when power is supplied to the external electrode 3 and the plasma is generated between internal electrodes 4, while spots arise on the hard carbon film with which generating of this plasma concentrated on the part with narrow spacing of the external electrode 3 and internal electrode 4 between regio oralis from the shoulder of plastic envelope B, and was formed, the problem of the regio oralis of plastic envelope B deforming with the heat then generated arises.
[0026] Invention concerning this application is made in order to solve the above-mentioned conventional trouble.

[0027] Namely, in order that the invention in this application may enable it to use a plastic envelope as a returnable container In case hold a plastic envelope in the vacuum chamber formed in the external electrode, an internal electrode is inserted in the interior, plasma discharge is performed between an external electrode and an internal electrode and the hard carbon film is formed in the internal surface of a plastic envelope It sets it as the 1st purpose to offer the manufacturing installation and the manufacture approach of a carbon film coating plastic envelope which can form the hard carbon film that there are no spots also about the container which has the excrescence which projects in the method of outside from external surface.
[0028] Furthermore, in case the invention in this application forms the hard carbon film in the internal surface of a plastic envelope, when plasma discharge concentrates on a container partially, it sets it as the 2nd purpose to offer the manufacturing installation and the manufacture approach of a carbon film coating plastic envelope without a possibility that spots may arise on the formed hard carbon film, or a plastic envelope may deform into it with the heat of the plasma.
[0029]
[Means for Solving the Problem] The manufacturing installation of the carbon film coating plastic envelope by the 1st invention In order to attain the 1st purpose of the above, a container is mostly held in the vacuum chamber of an analog with the appearance of the container formed in the external electrode. While inserting an internal electrode into the container held in the vacuum chamber of this external electrode and making a vacuum chamber into a vacuum, after supplying the material gas of a carbon source in a container, In the manufacturing installation of the carbon film coating plastic envelope which forms the hard carbon film in the internal surface of a container by generating the plasma between an external electrode and an internal electrode It is formed in the configuration which holds the container which has the lobe to which the internal surface of the vacuum chamber of said external electrode projects in the method of outside from a peripheral face. It has the infixation member which has the conductivity held in the vacuum chamber of said external electrode while covering the part of this container in which the lobe is formed at least by having the appearance of the container which has said lobe, and the internal surface mostly formed in the same configuration, and equipping a container and the container had been equipped. It is characterized by infixing said infixation member with which a container is equipped and which is held in a vacuum chamber with this container in the dead air space formed between the internal surface of the vacuum chamber of said external electrode, and the peripheral face of the container held in this vacuum chamber by holding the container which has a lobe.
[0030] Moreover, the manufacture approach of the carbon film coating plastic envelope by the 11th invention In order to attain said 1st purpose, a container is mostly held in the vacuum chamber of an analog with the appearance of the container formed in the external electrode. While inserting an internal electrode into the container held in the vacuum chamber of this external electrode and making a vacuum chamber into a vacuum, after supplying the material gas of a carbon source in a container, In the manufacture approach of the carbon film coating plastic envelope which forms the hard carbon film in the internal surface of a container by generating the plasma between an external electrode and an internal electrode Equip the external surface of a

container with the conductive infixation member which has the appearance of the container which has the lobe which projects in the method of out[redacted] from a peripheral face, and the intern[redacted]urface mostly formed in the same configuration, and the part of t[redacted] container in which the lobe is formed [redacted]east is covered. The container with which it was equipped with the infixation member in the vacuum chamber of the external electrode currently formed in the configuration which holds the container which has a lobe is held with an infixation member. It is characterized by infixing an infixation member into the dead air space formed between the internal surface of the vacuum chamber of an external electrode, and the peripheral face of the container held in this vacuum chamber by holding the container which has a lobe.

[0031] The manufacturing installation of a carbon film coating plastic envelope by the 1st above-mentioned invention, and the manufacture approach of the carbon film coating plastic envelope by the 11th invention In case the hard carbon film is formed in the internal surface of a plastic envelope by making the internal electrode which held the plastic envelope in the vacuum chamber formed in the external electrode, and was inserted into this container, and external inter-electrode one generate the plasma To a plastic envelope, for example, for the fall prevention which can be set like the contents packer of the plastic envelope which is a lightweight bottle When excrescence, such as a neck support ring which projects in the method of outside from the peripheral face of the regio oralis, is formed Although the internal surface of the vacuum chamber of an external electrode which holds the part in which the excrescence of a plastic envelope is not formed can be mostly formed in the same configuration with the appearance of a container so that a clearance may hardly be formed between the peripheral faces of the container held The internal surface of the vacuum chamber of an external electrode which holds the part in which the lobe of a container is formed Although it may be unable to form in the same configuration as the appearance of a container and a clearance will be formed between the peripheral faces of the part in which the internal surface of the vacuum chamber of an external electrode and the lobe of a container are formed for this reason in order to hold the excrescence The external surface of a container is equipped with the appearance of the container with which an internal surface has a lobe, and the conductive infixation member mostly formed in the same configuration, and after this infixation member has covered the part of a container in which the lobe is formed at least, it holds in the vacuum chamber of an external electrode with a container. And a clearance is made not to be formed between the internal surface of the vacuum chamber of an external electrode, and the peripheral face of a container by being infixed into the dead air space where the infixation member held in this vacuum chamber is formed between the internal surface of the vacuum chamber of an external electrode, and the peripheral face of the part in which the lobe of a container is formed.

[0032] According to the manufacturing installation of a carbon film coating plastic envelope by this 1st invention, and the manufacture approach of the carbon film coating plastic envelope by the 11th invention In case the plastic envelope which has excrescence which projects in the method of outside from a peripheral face, such as a support ring and a molding pattern, in the vacuum chamber formed in the external electrode is held and the hard carbon film is formed in the internal surface Since it can avoid forming a clearance for the internal surface of the vacuum chamber of an external electrode, and the peripheral face of the plastic envelope held in this vacuum chamber all over a container The hard carbon film by plasma discharge can be formed on the conditions almost same about the part in which the lobe of a plastic envelope is formed, and other parts. By this The hard carbon film can be formed that there are no spots in the internal surface also about the plastic envelope with which the excrescence is formed outside.

[0033] The manufacturing installation of the carbon film coating plastic envelope by the 2nd invention In order to attain the 1st purpose of the above, while covering the peripheral face of the part in which the container which has the lobe which projects in the method of the outside of the direction of a path from a peripheral face is equipped with said infixation member in addition to the configuration of said 1st invention, and the lobe of this container is formed When a container is equipped and it holds in the vacuum chamber of said external electrode, the peripheral face is characterized by being held after having been mostly contacted by the internal surface of a vacuum chamber.

[0034] Moreover, the manufacture approach of the carbon film coating plastic envelope by the 12th invention In order to attain said 1st purpose, it adds to the 11th configuration. The part in which the external surface of a part in which the lobe of a container is formed is equipped with the configuration of a container of having the lobe to which an internal surface projects in the method of the outside of the direction of a path from a peripheral face, and the infixation member mostly formed in the same configuration, and the lobe of this container is formed is covered. It is characterized by infixing into the dead air space formed between the internal surface of the vacuum chamber of an external electrode, and the peripheral face of the container held in this vacuum chamber by holding with a container the infixation member with which this container was equipped in the vacuum chamber of an external electrode, and holding the container which has a lobe.

[0035] When excrescence, such as a support ring for the fall prevention which can be set like the packer of

contents, and a molding pattern, is formed in the necessary part of a container, in order that the manufacturing installation of a carbon film coating plastic envelope by the 2nd above-mentioned invention and the manufacture approach of the carbon film coating plastic envelope by the 12th invention may lose the irregularity by the lobe in the peripheral face of this container, the necessary part of the container with which the lobe is formed is equipped with an infixation member.

[0036] When the container with which it was equipped with the infixation member is held in the vacuum chamber of an external electrode by this, the external surface of an infixation member and the internal surface of the vacuum chamber which counters are formed in the same configuration as the outer diameter of this infixation member. Since it continues all over a container and can avoid forming a clearance between the internal surfaces of a vacuum chamber by being formed in the configuration as the appearance of other parts of a container where other parts of the internal surface of a vacuum chamber are still the more nearly same It can prevent that spots occur on the hard carbon film formed in the internal surface of a container.

[0037] The manufacturing installation of the carbon film coating plastic envelope by the 3rd invention In order to attain the 1st purpose of the above, it adds to the configuration of said 2nd invention. Said infixation member consists of two parts, the part with which an upper part part is equipped rather than the lobe of the flange configuration which projects in the method of the outside of the direction of a path from the peripheral face of the regio oralis of a container, and the part with which a lower part part is equipped. When two parts of this infixation member are formed so that that outer diameter may become almost the same as that of the outer diameter of a lobe, respectively, and the regio oralis of a container is equipped with them on both sides of a lobe, it is characterized by a peripheral face becoming almost flat-tapped with the peripheral face of a lobe.

[0038] The manufacturing installation of the carbon film coating plastic envelope by the 3rd above-mentioned invention When the lobe of a flange configuration like the support ring for the fall prevention which can be set like the packer of contents is formed in the regio oralis to which the path is thin rather than the drum section like a beverage bottle container like the 2nd invention In order to lose the irregularity by the lobe in the peripheral face of this container, into the necessary part of containers, such as regio oralis in which the lobe is formed A container is equipped so that one side of the infixation member which consists of two parts may be located in the upper part section of a lobe, and after another side has sandwiched the lobe between one infixation members, it is equipped under the lobe.

[0039] Since the external surface of an infixation member and the external surface of a lobe become flat-tapped by being formed at this time so that the outer diameter of two parts of this infixation member may become almost the same as that of the outer diameter of a lobe, respectively and the irregularity in the peripheral face of a container is lost It can prevent that spots occur on the hard carbon film which it continues all over a container, can avoid forming a clearance between the internal surfaces of a vacuum chamber like the 2nd invention, and is formed in the internal surface of a container. At this time, since it is not necessary to make the outer diameter of an infixation member larger than the outer diameter of a lobe, it is lightweight.

[0040] The manufacturing installation of the carbon film coating plastic envelope by the 4th invention In order to attain the 1st purpose of the above, it adds to the configuration of said 1st invention. Said infixation member is characterized by being mostly formed in the same configuration with the appearance of the container which has the lobe to which that internal surface projects in the method of the outside of the direction of a path from a peripheral face, holding a container in the interior, and holding in the vacuum chamber of said external electrode with this held container.

[0041] Moreover, the manufacturing installation of the carbon film coating plastic envelope by the 13th invention In order to attain the 1st purpose of the above, it adds to the configuration of said 11th invention. An internal surface holds a container in the appearance of the container which has the lobe which projects in the method of the outside of the direction of a path from a peripheral face, and the infixation member mostly formed in the same configuration, and covers the peripheral face of a container. It is characterized by holding the infixation member which held this container in the vacuum chamber of the external electrode formed in the almost same configuration as the appearance of an infixation member.

[0042] The manufacturing installation of a carbon film coating plastic envelope by the 4th above-mentioned invention, and the manufacture approach of the carbon film coating plastic envelope by the 13th invention The infixation member is the shape of a case which is formed so that the internal surface may become the almost same configuration as the appearance of a container, and can hold the whole container. The container with which excrescence, such as a support ring for fall prevention and a molding pattern, is formed in the peripheral face is held in that interior, and it holds in the vacuum chamber of an external electrode with this held container. Thus, since it can lessen more that a clearance is formed between the internal surfaces of this vacuum chamber when this container is held in the vacuum chamber of an external electrode by continuing all over the and covering the peripheral face of the container with which the excrescence is formed in the peripheral face,

generating of the spots of the hard carbon film formed in the internal surface of a container can be prevented more effectively.

[0043] The manufacturing installation of the carbon film coating plastic envelope by the 5th invention In order to attain the 2nd purpose of the above, a container is mostly held in the vacuum chamber of an analog with the appearance of the container formed in the external electrode. While inserting an internal electrode into the container held in the vacuum chamber of this external electrode and making a vacuum chamber into a vacuum, after supplying the material gas of a carbon source in a container, In the manufacturing installation of the carbon film coating plastic envelope which forms the hard carbon film in the internal surface of a container by generating the plasma between an external electrode and an internal electrode Said external electrode is divided into two or more parts, and a vacuum chamber is formed by being attached where two or more of these divided parts of each other are insulated by the insulating member. It is characterized by connecting an RF generator to each of a part by which this external electrode was divided, and supplying power to each part of an external electrode according to an individual.

[0044] Moreover, the manufacture approach of the carbon film coating plastic envelope by the 14th invention In order to attain the 2nd purpose of the above, a container is mostly held in the vacuum chamber of an analog with the appearance of the container formed in the external electrode. While inserting an internal electrode into the container held in the vacuum chamber of this external electrode and making a vacuum chamber into a vacuum, after supplying the material gas of a carbon source in a container, In the manufacture approach of the carbon film coating plastic envelope which forms the hard carbon film in the internal surface of a container by generating the plasma between an external electrode and an internal electrode By being attached where two or more divided parts of each other are insulated by the insulating member, an RF generator is connected to each part of said external electrode which forms a vacuum chamber in the interior, respectively, and it is characterized by switching on power according to an individual at each part which forms the vacuum chamber of an external electrode.

[0045] The manufacturing installation of a carbon film coating plastic envelope by the 5th above-mentioned invention, and the manufacture approach of the carbon film coating plastic envelope by the 14th invention By supplying power to each insulated part according to an individual from an RF generator, and generating the plasma between each part into which the external electrode was divided, and an internal electrode The hard carbon film is formed in the internal surface of the plastic envelope held in the vacuum chamber. At this time By insulating each part of each other which forms the vacuum chamber of an external electrode, the plasma generated between an external electrode and an internal electrode does not concentrate on a part with a small distance between this external electrode and an internal electrode. And according to each part of an external electrode, and an internal inter-electrode distance, the magnitude or the making time of power can be set up for every part of an external electrode in the case of the injection of the power to an external electrode.

[0046] The appearance configuration of an internal electrode where it is located in the vacuum chamber of an external electrode by this, by constraint by the configuration of the plastic envelope held in a vacuum chamber When all of the internal surface of an external electrode and the distance between internal electrodes are not made to the equal distance, the distance of an external electrode and the internal electrode of the plastic envelope with which the plasma generated between internal electrodes was held in the vacuum chamber of an external electrode concentrates on a short part. There is no possibility that spots may arise on the hard carbon film formed in the internal surface of a plastic envelope, and a plastic envelope may deform into it with the heat generated by concentration of the plasma.

[0047] furthermore, make it smaller than the power which supplies the magnitude of the power supplied to the part of an external electrode with a small distance with an internal electrode to the part of an external electrode with a large distance with an internal electrode, or Moreover, by making the making time of the power to the part of an external electrode with a small distance with an internal electrode shorter than the making time of the power to the part of an external electrode with a large distance with an internal electrode, it can continue all over the internal surface of a plastic envelope, and the hard carbon film can be formed equally.

[0048] the configuration of the 5th invention in order that the manufacturing installation of the carbon film coating plastic envelope by the 6th invention may attain said 2nd purpose -- in addition, it is characterized by dividing said external electrode into two parts of the part which holds the part, shoulder, and regio oralis which hold the drum section of a bottle.

[0049] The manufacturing installation of the carbon film coating plastic envelope by this 6th invention For example, in order to form the hard carbon film in the plastic envelope currently formed so that the path of the part applied to a shoulder from the regio oralis like the bottle of a bevel use may become smaller than the path of a drum section By dividing the external electrode which holds this plastic envelope into the part which holds the shoulder and regio oralis of the bottle with which the part which holds the drum section of a bottle, the

internal surface of this external electrode, and the distance between internal electrodes become smaller than the hold part for a drum section of a [redacted]le When the plasma is generated bet[redacted] an external electrode and an internal electrode, it prevents that this plasma concentrates on the shoulder or regio oralis of a bottle with a short distance with an internal electrode. The shoulder or regio oralis of this bottle can deform with the heat of the plasma, and it can prevent that spots occur on the formed hard carbon film between the drum sections of a bottle.

[0050] The manufacturing installation of the carbon film coating plastic envelope by the 7th invention In order to attain said purpose of the 1st and 2, it adds to the 5th configuration of invention. It is formed in the configuration which holds the container which has the lobe to which the internal surface of the vacuum chamber of the external electrode which consists of said two or more parts projects in the method of outside from a peripheral face. It has the infixation member which has the conductivity held in the vacuum chamber of said external electrode while covering the part of this container in which the lobe is formed at least by having the appearance of the container which has said lobe, and the internal surface mostly formed in the same configuration, and equipping a container and the container had been equipped. It is characterized by infixing said infixation member with which a container is equipped and which is held in a vacuum chamber with this container in the dead air space formed by holding said excrescence between the internal surface of the vacuum chamber of said external electrode, and the peripheral face of the container held in this vacuum chamber.

[0051] The manufacturing installation of the carbon film coating plastic envelope by this 7th invention By supplying power to each insulated part according to an individual from an RF generator, and generating the plasma between each part into which the external electrode was divided, and an internal electrode The hard carbon film is formed in the internal surface of the plastic envelope held in the vacuum chamber. At this time By insulating each part of each other which forms the vacuum chamber of an external electrode, the plasma generated between an external electrode and an internal electrode does not concentrate on a part with a small distance between this external electrode and an internal electrode. And in case the plastic envelope which has excrescence which projects in the method of outside from a peripheral face, such as a support ring and a molding pattern, in the vacuum chamber formed in the external electrode is held and the hard carbon film is formed in the internal surface Since the clearance formed between the internal surface of the vacuum chamber of an external electrode and the peripheral face of the plastic envelope held in this vacuum chamber is filled with the infixation member with which a container is equipped and which is held The hard carbon film by plasma discharge can be formed on the conditions almost same about the part in which the lobe of a plastic envelope is formed, and other parts. While being able to prevent more completely generating of the spots of the hard carbon film formed also about the plastic envelope with which the excrescence is formed outside by this, it can prevent that a plastic envelope deforms with the heat of the plasma.

[0052] the configuration of the 5th invention in order that the manufacturing installation of the carbon film coating plastic envelope by the 8th invention may attain said 2nd purpose -- in addition, it is characterized by having the RF generator of the number of parts with which said external electrode was divided, and the same number, and connecting with the part into which the external electrode with which each RF generator corresponds, respectively was divided.

[0053] Moreover, the manufacture approach of the carbon film coating plastic envelope by the 15th invention is characterized by connecting the RF generator of the number of parts with which said external electrode was divided, and the same number to the part into which the corresponding external electrode was divided, respectively in addition to the 14th configuration of invention, in order to attain said 2nd purpose.

[0054] The RF generator of dedication is prepared for each part into which the external electrode was divided, respectively, and the manufacturing installation of a carbon film coating plastic envelope by the 8th above-mentioned invention and the manufacture approach of the carbon film coating plastic envelope by the 15th invention are connected to each part of the external electrode with which each RF generator corresponds the piece every. By this, the power corresponding to the distance between this each part and internal electrode can be supplied to each part into which the external electrode was divided, respectively, and the uniform hard carbon film can be easily formed in it at a plastic envelope.

[0055] In order to attain said 2nd purpose, in addition to the 5th configuration of invention, the manufacturing installation of the carbon film coating plastic envelope by the 9th invention is equipped with the RF generator of a piece, and is characterized by connecting this RF generator to each part into which said external electrode was divided through a circuit changing switch.

[0056] Moreover, the manufacture approach of the carbon film coating plastic envelope by the 16th invention is characterized by connecting the RF generator of a piece to each part into which said external electrode was divided through a circuit changing switch in addition to the 14th configuration of invention, in order to attain said 2nd purpose.

[0057] The RF generator of a piece is connected to two or more parts into which the external electrode was divided through the circuit changing switch, respectively, and, as for the manufacturing installation of a carbon film coating plastic envelope by the 9th above-mentioned invention, and the manufacture approach of the carbon film coating plastic envelope by the 16th invention, power is supplied one by one to each part of an external electrode by the change of this circuit changing switch. The uniform hard carbon film can be formed in a plastic envelope by the approach of setting up the switching time of a circuit changing switch by this, corresponding to the distance between each part of an external electrode, and an internal electrode, while being able to supply power to two or more parts into which the external electrode was divided by the RF generator of a piece.
[0058] in order that the manufacturing installation of the carbon film coating plastic envelope by the 10th invention may attain said purpose of the 1st and 2 -- the configuration of the 1st invention or the 5th invention -- in addition, it is characterized by preparing the inspection hole which can check the inside of a vacuum chamber by looking through the heat resisting glass attached in this external electrode in the part of the arbitration of the wall of said external electrode.
[0059] The manufacturing installation of the carbon film coating plastic envelope by this 10th invention In the equipment which equips the plastic envelope of the 1st invention with an infixation member, and is held in a vacuum chamber, or the equipment which supplies power to each part into which the external electrode which forms a vacuum chamber was divided according to an individual Since the generating condition of the plasma in a vacuum chamber can be checked by looking through the inspection hole in which it was prepared by the wall of an external electrode, the generating condition of the plasma can be held in the optimal condition, and generating of the spots of the hard carbon film formed of this can be prevented.
[0060]
[Embodiment of the Invention] Hereafter, it explains, referring to a drawing about the gestalt of the implementation of this invention considered to be the most suitable.
[0061] Drawing 1 shows an example of the manufacturing installation of the carbon film coating plastic envelope by this invention.
[0062] In addition, since this drawing 1 is the thing of the format which inserts a plastic envelope from a lower part into an external electrode as mentioned later, that vertical direction is indicated to be drawing 14 by the reverse sense.
[0063] The manufacturing installation of this carbon film coating plastic envelope The external electrode 10 with which vacuum chamber 10C of the almost same configuration as the appearance of plastic envelope B which consists of body section 10A and lid 10B, and performs coating inside like the manufacturing installation of drawing 14 was formed, It has the internal electrode 11 inserted into plastic envelope B which has the appearance of almost similarity with the internal configuration of plastic envelope B, and was held in vacuum chamber 10C of the external electrode 10. Plastic envelope B is put on lid 10B of the external electrode 10 at an erection condition, goes up, and it is inserted into body section 10A, and when the interior of body section 10A is sealed by lid 10B, it holds in vacuum chamber 10C of the external electrode 10.
[0064] The sign 2 in drawing 1 is an electric insulating plate.
[0065] The DLC film is formed in the internal surface of plastic envelope B by the inside of vacuum chamber 10C being made a vacuum by actuation of the vacuum devices which the manufacturing installation of the above-mentioned carbon film coating plastic envelope does not illustrate, and impressing high-frequency voltage between the external electrode 10 and an internal electrode 11 from an RF generator, and generating the plasma, after material gas is supplied in plastic envelope B held in the external electrode 10 from the material gas feeder.
[0066] Although the above actuation is the same as that of the manufacturing installation of drawing 14 , the manufacturing installation in this example is formed so that the path of the internal surface of vacuum chamber 10C which the peripheral face of regio-oralis B' of plastic envelope B counters may become almost the same as the outer diameter of a support ring Bb, when plastic envelope B is held, in order to form the DLC film in plastic envelope B by which the support ring Bb for fall prevention of a container is formed in regio-oralis B'.
[0067] And when plastic envelope B is inserted into vacuum chamber 10C of the external electrode 10, the copper infixation rings 12 and 13 as shown in drawing 2 for filling the clearance formed between the peripheral face of regio-oralis B' other than the part in which the support ring Bb of this plastic envelope B is formed, and the internal surface of vacuum chamber 10C thru/or 5 are prepared for this manufacturing installation.
[0068] A vertical edge is the cylinder member of the hollow by which opening was carried out, and the infixation ring 12 can be divided now into two semi-cylindrical shape ring 12A, as shown in drawing 2 and 3.
[0069] In the wall section of semi-cylindrical shape ring 12A of this pair Hold section 12a which has the almost same bore as the outer diameter of an upper part part in drawing 3 sequentially from [thread part / Ba / of regio-oralis B' of plastic envelope B] an upper limit side, respectively, Hold section 12c which has the outer

diameter almost more nearly same than the thread part Ba of hold section 12b which has the outer diameter, the almost same outer diameter as width [redacted] width of a thread part Ba of plastic [redacted] elope B, and regio-oralis B' of plastic envelope B as the outer diameter of a lower part part is formed.
[0070] And rather than the support ring Bb of regio-oralis B' of plastic envelope B, semi-cylindrical shape ring 12A of this pair is attached outside by the upper part from those both sides, and at this time, the hold sections 12a, 12b, and 12c are applied to the peripheral face of the lower part parts of the upper part part of the thread part Ba of regio-oralis B' of plastic envelope B, a thread part Ba, and a thread part Ba, respectively, and it covers the peripheral face of this regio-oralis B' completely.
[0071] A vertical edge is the cylinder member of the hollow by which opening was carried out, and the infixation ring 13 can be divided now into two semi-cylindrical shape ring 13A, as shown in drawing 4 and 5.
[0072] The internal surface of semi-cylindrical shape ring 13A of this pair is formed so that it may curve and spread in the method of outside, as it dies caudad so that a bore may become the same as the outer diameter of the peripheral face below the support ring Bb of regio-oralis B' of plastic envelope B, respectively.
[0073] And rather than the support ring Bb of regio-oralis B' of plastic envelope B, semi-cylindrical shape ring 13A of this pair is attached outside by the downward part from those both sides, and at this time, that inner skin is applied to the peripheral face of regio-oralis B' of plastic envelope B, and it covers the peripheral face of this regio-oralis B' completely.
[0074] The outer diameter of the peripheral face of these infixation rings 12 and 13 is fabricated so that it may become almost the same as the outer diameter of the support ring Bb formed in plastic envelope B, respectively.

[0075] The manufacturing installation of the above-mentioned carbon film coating plastic envelope Semi-cylindrical shape ring 12A of the infixation ring 12 is attached outside an upper part location for plastic envelope B which performs coating from both sides rather than the support ring Bb of the regio-oralis B'. Where semi-cylindrical shape ring 13A of the infixation ring 13 was attached outside the lower part location from both sides and the peripheral face of the upper part of the support ring Bb of regio-oralis B' and a lower part is covered with these infixation rings 12 and 13 rather than a support ring Bb It is put on lid 10B of the external electrode 10 in the state of erection, and when this lid 10B goes up, plastic envelope B is inserted into body section 10A of the external electrode 10.
[0076] The infixation rings 12 and 13 currently attached outside regio-oralis B' of plastic envelope B are joined so that the heat-resistant double-sided tape with which the semi-cylindrical shape rings 12A and 13A which constitute each were stuck on the end face contacted mutually may not separate, and it is made for the infixation rings 12 and 13 not to secede from plastic envelope B at this time.
[0077] In addition, when a projection is prepared in an end face, a fitting hole is established in an other-end side, respectively and the semi-cylindrical shape rings 12A and 13A are attached in regio-oralis B' of plastic envelope B for while being contacted mutually [the semi-cylindrical shape rings 12A and 13A of the infixation rings 12 and 13], respectively, the approach it is made for the semi-cylindrical shape rings 12A and 13A not to separate mutually, respectively is also considered by carrying out fitting of the fitting hole to a projection.
[0078] Plastic envelope B is inserted by the rise of lid 10B of the external electrode 10 into body section 10A, and is held in vacuum chamber 10C formed by being stuck to lid 10B at the opening edge of body section 10A. And in case this plastic envelope B is inserted into body section 10A of the external electrode 10, the internal electrode 11 arranged in the shape of the same axle inside this body section 10A is inserted in the interior of plastic envelope B from the open end of that regio-oralis B'.
[0079] And where plastic envelope B is completely held in vacuum chamber 10C The peripheral face of the support ring Bb of regio-oralis B' of plastic envelope B and the peripheral face of the infixation rings 12 and 13 attached in regio-oralis B' It counters so that a clearance may not be formed in the internal surface of vacuum chamber 10C which is countered so that a clearance may not be formed in the internal surface of vacuum chamber 10C which counters, and the peripheral face of shoulders other than regio-oralis B' of plastic envelope B and a drum section counters, respectively.
[0080] In the condition that the inside of vacuum chamber 10C of the external electrode 10 is sealed as mentioned above, and a clearance is hardly formed between the internal surface of this vacuum chamber 10C, the peripheral face of plastic envelope B, and the peripheral face of the infixation rings 12 and 13 After the vacuum devices which are not illustrated operated, air was discharged and the inside of vacuum chamber 10C was made into the vacuum, The material gas (carbon source gas, such as aliphatic hydrocarbon and aromatic hydrocarbon carbon) supplied from a material gas feeder blows off from the blow-off hole which was formed in the internal electrode 11 and which is not illustrated in plastic envelope B.
[0081] And after the concentration of this material gas turns into predetermined concentration, high-frequency voltage is impressed to the external electrode 10 from an RF generator, between the grounded internal

electrodes 11, the plasma is generated and the DLC film is formed of this at the internal surface of plastic envelope B.
[0082] That is, formation of the DLC film in the internal surface of this plastic envelope B is performed by the plasma-CVD method like the manufacturing installation of drawing 14 , an electron accumulates it in the internal surface of the external electrode 10 insulated by the plasma generated between the external electrode 10 and the internal electrode 11, and predetermined fall of potential produces it.
[0083] by this , the carbon and hydrogen of a hydrocarbon which be material gas which exist in the plasma be ionize by plus , respectively , it collide with the internal surface of plastic envelope B prolong along with the internal surface of the external electrode 10 at random , and the hard carbon film which become the internal surface of plastic envelope B from very precise DLC be form of association of approach the carbon atoms and carbon atom , and a hydrogen atom , and balking (the sputtering effectiveness) of the hydrogen atom which be further once ****** .
[0084] At this time, like between the shoulder of plastic envelope B and a drum section, and the internal surfaces of vacuum chamber 10C The peripheral face of regio-oralis B' is contacted by the inner skin of the infixation rings 12 and 13. By not forming a clearance between the peripheral face of these infixation rings 12 and 13, and the internal surface of vacuum chamber 10C, therefore not forming a clearance between the peripheral face of regio-oralis B', and the internal surface of vacuum chamber 10C Since the DLC film is formed on the same conditions as the shoulder of plastic envelope B, and a drum section, it is prevented by the formed DLC film that spots arise.
[0085] Drawing 6 shows other examples of the manufacturing installation of the carbon film coating plastic envelope by this invention.
[0086] To covering only the peripheral face of the regio oralis of a plastic envelope with an infixation ring, and holding in an external electrode, in the infixation case 20, the manufacturing installation of drawing 1 covers all the peripheral faces of a plastic envelope B1, and holds the manufacturing installation of this drawing 6 in the external electrode 21.
[0087] Namely, the infixation case 20 is a cylinder member in the air, and can be divided now into two semi-cylindrical shape case 20A shown in drawing 7 .
[0088] this -- a pair -- a semi-cylindrical shape -- a case -- 20 -- A -- respectively -- the -- an internal surface -- 20 -- a -- a configuration -- a plastic envelope -- B -- one -- an appearance -- the same -- a configuration -- becoming -- as -- fabricating -- having -- **** -- this -- an internal surface -- 20 -- a -- a plastic envelope -- B -- one -- the regio oralis -- B -- one -- ' -- holding -- having -- a part -- a support ring -- Bb -- one (refer to drawing 6) -- fitting -- carrying out -- having -- a circular sulcus -- 20 -- a -- ' -- forming -- having -- **** .
[0089] and -- while semi-cylindrical shape case 20A of this pair is attached outside plastic envelope B from both sides, respectively, a plastic envelope B1 is completely held in the interior and the peripheral face of a plastic envelope B1 is contacted by internal-surface 20a of semi-cylindrical shape case 20A at this time -- a support ring Bb1 -- circular-sulcus 20a' -- fitting is carried out inside and that external surface is contacted by the internal surface of circular-sulcus 20a'.
[0090] The external electrode 21 consists of body section 21A of a cylindrical shape, and lid 21B, and vacuum chamber 21C of a cylindrical shape which has the outer diameter of the infixation case 20 and the almost same path is formed in body section 21A.
[0091] After semi-cylindrical shape case 20A of a pair is attached outside from both sides by the plastic envelope B1 with which the manufacturing installation of the above-mentioned carbon film coating plastic envelope performs coating and a plastic envelope B1 is held in the infixation case 20, when it is put on lid 21B of the external electrode 21 in the state of erection the whole infixation case 20 and this lid 21B goes up, a plastic envelope B1 is inserted into body section 21A of the external electrode 21. At this time, an internal electrode 22 is inserted from that regio-oralis B1' into a plastic envelope B1.
[0092] And like [after vacuum chamber 21C of the external electrode 21 is sealed] the manufacturing installation of the example of said drawing 1 , after passing through the process of supply of exhaust air and material gas, the DLC film is formed in the internal surface of a plastic envelope B1 by performing plasma discharge between the external electrode 21 and an internal electrode 22.
[0093] At this time, a clearance is hardly formed between the plastic envelope B1 held in vacuum chamber 21C of the external electrode 21, and the internal surface of the infixation case 20. Moreover, since a clearance is not formed between the peripheral face of the infixation case 20, and the internal surface of vacuum chamber 21C of the external electrode 21 Since a clearance hardly exists between a plastic envelope B1 and the external electrode 21, therefore the DLC film can be formed on the same conditions also about which part of a plastic envelope B1, spots do not arise in formation of the DLC film.

[0094] According to the manufacturing installation by the above-mentioned example, the plastic envelope B1 which forms the DLC film in the infixion case 20 is covered completely. While being able to prevent more certainly that spots are made to the DLC film which the clearance formed between the peripheral face of a plastic envelope B1 and the internal surface of the external electrode 21 could be decreased more, and was formed of this The DLC film can be formed about the plastic envelope B1 of any configurations.
[0095] Drawing 8 shows the example of further others of the manufacturing installation of the carbon film coating plastic envelope by this invention, and the external electrode 30 is constituted by body section 30A and lid 30B, and is divided into two parts, upper part 30Aa and lower partial 30Ab, by the flat surface where that axis and body section 30A cross at right angles.
[0096] And while anchor ring-like electric insulating plate 30Ac is infixed, this electric insulating plate 30Ac pastes firmly the parting plane of upper part 30Aa and lower partial 30Ab, respectively and body section 30A of the external electrode 30 is formed in one between these two divided upper part 30Aa(s) and lower partial 30Ab (s), between upper part 30Aa and lower partial 30Ab(s) is insulated by electric insulating plate 30Ac.
[0097] Since thermal resistance and pressure resistance are required of this electric insulating plate 30Ac according to the magnitude and weight of the external electrode 30, the ceramics is suitable for it. Moreover, a macromolecule material can be used as a material of an electric insulating plate about what has thermal resistance, such as Teflon, although use is restricted since the pressure resistance is small.
[0098] In the external electrode 30 constituted by this body section 30A and lid 30B, vacuum chamber 30C of the appearance of plastic envelope B and an abbreviation same configuration which forms the DLC film is formed. Among drawing 8 , when plastic envelope B is held in vacuum chamber 30C, 31 are an internal electrode inserted into this plastic envelope B, and have the configuration of the internal surface of plastic envelope B, and the configuration of abbreviation similarity.
[0099] Band-like copper plate 32A is wound around the peripheral face of upper part 30Aa of body section 30A of this external electrode 30, RF generator 32C is connected to this copper plate 32A through matching box (adjustment machine) 32B, and power is supplied to upper part 30Aa from this RF generator 32C.
[0100] Similarly, band-like copper plate 33A is wound around the peripheral face of lower partial 30Ab of body section 30A, RF generator 33C is connected to this copper plate 33A through matching box 33B, and power is supplied to lower partial 30Ab separately [upper part 30Aa] from this RF generator 33C.
[0101] Plastic envelope B which forms the DLC film is put on lid 30B at an erection condition, and the manufacturing installation of the carbon film coating plastic envelope in the above-mentioned example is inserted into body section 30A of the external electrode 30, when this lid 30B goes up. At this time, the internal electrode 31 arranged in the shape of the same axle inside this body section 30A is inserted in the interior of plastic envelope B from opening of that regio-oralis B'.
[0102] Thus, if material gas is supplied in plastic envelope B after plastic envelope B is held in vacuum chamber 30C and this vacuum chamber 30C is made into a vacuum By supplying power to upper part 30Aa of the external electrode 30 through matching box 32B from RF generator 32C, and copper plate 32A, and generating the plasma between this upper part 30 Aa and internal electrode 31 The DLC film is formed in the internal surface of regio-oralis B' of plastic envelope B, and a shoulder.
[0103] Moreover, power is supplied to lower partial 30Ab of the external electrode 30 through matching box 33B from RF generator 33C, and copper plate 33A, and the DLC film is formed in the internal surface of the drum section of plastic envelope B by generating the plasma between this lower partial 30 Ab and internal electrode 31.
[0104] Thus, body section 30A of the external electrode 30 is divided into two parts of lower partial 30Ab which counter upper part 30Aa which counters the regio oralis and shoulder of plastic envelope B, and a drum section. By insulating these two parts and supplying power to each separately Regio-oralis B' of plastic envelope B is thin like illustration. For example, from constraint of the configuration of the regio-oralis B' From the regio oralis of plastic envelope B, when spacing between the external electrode 30 in the part between shoulders and an internal electrode 31 becomes narrower than spacing between the two electrodes in the part of the drum section of plastic envelope B By adjusting matching boxes 32B and 33B so that the power supplied to upper part 30Aa from RF generator 32C may become smaller than the power supplied to lower partial 30Ab from RF generator 33C Spots can arise on the DLC film with which generating of the plasma concentrates on a part with narrow spacing of the external electrode 30 and internal electrode 31 between regio oralis from the shoulder of plastic envelope B, and is formed, and it can prevent that the regio oralis of plastic envelope B deforms with the heat then generated.
[0105] Moreover, instead of making it the power which adjusts matching boxes 32B and 33B, and is switched on from RF generator 32C as mentioned above become smaller than the power switched on from RF generator 33C, it adjusts so that the making time of the power from RF generator 32C may become shorter than the making

time of the power from RF generator 33C, and deformation of plastic envelope B by the spots and heat of the DLC film which were formed can be prevented from happening.
[0106] In drawing 8 , the inspection hole W1 of a piece is formed in upper part 30Aa of the external electrode 30 at the wall, and two inspection holes W2 and W3 are prepared in lower partial 30Ab at the wall.
[0107] Heat-resistant quartz glass g1, g2, and g3 is inserted in in the bores w1 and w2 formed in the wall of upper part 30Aa or lower partial 30Ab, and w3, respectively, and these inspection holes W1 and W2 and W3 can observe the condition of the plasma in this vacuum chamber 30C from the outside, maintaining the sealing condition in vacuum chamber 30C.
[0108] in addition -- although two inspection holes are prepared in upper part 30Aa in the example of this drawing 8 at one place and lower partial 30Ab -- this inspection hole -- each proper part of upper part 30Aa and lower partial 30Ab -- ******** of arbitration -- things are made (in addition, this inspection hole can also be prepared in the manufacturing installation of the carbon film coating plastic envelope of drawing 1).
[0109] Drawing 9 shows the example of the manufacturing installation which combined the infixation rings 12 and 13 used for the manufacturing installation of the carbon film coating plastic envelope of above-mentioned drawing 8 in the manufacturing installation of drawing 1 , and in case it inserts plastic envelope B by which the support ring Bb was formed in regio-oralis B' into vacuum chamber 30C of the external electrode 30, it equips the upper part part and lower part part of a support ring Bb of this plastic envelope B with the infixation rings 12 and 13, respectively. [of regio-oralis B']
[0110] The manufacturing installation of this drawing 9 by dividing body section 30A of the external electrode 30 into two parts, upper part 30Aa and lower partial 30Ab, each other insulated by electric insulating plate 30Ac like the manufacturing installation of drawing 8 While being able to prevent partial concentration of the plasma by adjusting the magnitude or the making time of power supplied to besides section partial 30Aa and lower partial 30Ab, respectively Since formation of the clearance between the internal surfaces of the external electrode 30 in regio-oralis B' in which the support ring Bb of plastic envelope B was formed can be prevented, generating of the spots of the formed DLC film can be prevented more completely.
[0111] Drawing 10 is the same as that of the manufacturing installation of drawing 8 about the configuration which the example of further others of the manufacturing installation of the carbon film coating plastic envelope by this invention is shown, body section 30A of the external electrode 30 is divided into two parts, upper part 30Aa and lower partial 30Ab, and electric insulating plate 30Ac is infixed between these two parts, and is insulated mutually, or the configuration of internal electrode 31 and others.
[0112] Band-like copper plate 40A' is wound around the peripheral face of upper part 30Aa of body section 30A of this external electrode 30 for band-like copper plate 40A again at the peripheral face of lower partial 30Ab, matching box 40B is connected to this copper plate 40A, and matching box 40B' is connected to copper plate 40A'.
[0113] And RF generator 40D of a piece is connected to these matching box 40B and 40B' through circuit-changing-switch 40C.
[0114] Although the manufacturing installation of this drawing 10 forms the DLC film in the internal surface of plastic envelope B held in vacuum chamber 30C like the manufacturing installation of drawing 8 by supplying power to upper part 30Aa of the external electrode 30, and lower partial 30Ab separately, respectively, at this time, from RF generator 40D, power switches to upper part 30Aa and lower partial 30Ab by circuit-changing-switch 40C, and it is supplied to them.
[0115] Formation of the DLC film is performed to the internal surface of the part which power is first supplied to upper part 30Aa from RF generator 40D, and applies this manufacturing installation to a shoulder from regio-oralis B' of plastic envelope B, after the time amount from which the thickness of this DLC film formed turns into predetermined thickness passes, circuit-changing-switch 40C is switched and the injection of the power to upper part 30Aa is stopped.
[0116] And next, power is supplied to lower partial 30Ab from RF generator 40D, and after the time amount in which the DLC film of the same thickness as the thickness of the DLC film formed in the internal surface of the drum section of plastic envelope B from regio-oralis B' at the internal surface of the part of a shoulder is formed passes, the injection of the power is stopped by the change of circuit-changing-switch 40C.
[0117] In addition, in the above, the change of circuit-changing-switch 40C can be performed by connecting and controlling a microcomputer to this circuit-changing-switch 40C.
[0118] Although the DLC film is formed in the whole internal surface of plastic envelope B as mentioned above Since the DLC film is formed in the internal surface of the part of a shoulder, and the internal surface of a drum section according to an individual from regio-oralis B' of plastic envelope B, respectively at this time While it is prevented by the DLC film with which the plasma concentrated and was formed in the part with narrow spacing of an external electrode and an internal electrode of the injection of the power to an external electrode like [in

the case of forming the DLC film by the manufacturing installation of drawing 8] that spots arise Since power can be supplied to each part of the external electrode 30 divided by the RF generator of a piece, cheap-ization of equipment can be attained.
[0119] In addition, in the manufacturing installation of this drawing 10 , the sequence of an injection of power may be contrary to the above.
[0120] moreover, as an approach of making the same thickness of the DLC film formed in each part of the wall section of plastic envelope B After making it the magnitude of the power supplied to upper part 30Aa and lower partial 30Ab by accommodation of matching box 40B and 40B' become the same mutually The approach (the power making time to upper part 30Aa with narrow spacing with an internal electrode is made shorter than the making time to lower partial 30Ab) of adjusting the switching time of circuit-changing-switch 40C, After making the same switching time of circuit-changing-switch 40C both, by accommodation of matching box 40B and 40B' There is a method (power to upper part 30Aa with narrow spacing with an internal electrode is made smaller than the power to lower partial 30Ab) of adjusting the magnitude of the power supplied to upper part 30Aa and lower partial 30Ab.
[0121] Drawing 11 shows the example of the manufacturing installation which combined the infixation rings 12 and 13 used for the manufacturing installation of the carbon film coating plastic envelope of above-mentioned drawing 10 in the manufacturing installation of drawing 1 . In case the manufacturing installation of this drawing 11 inserts plastic envelope B by which the support ring Bb was formed in regio-oralis B' into vacuum chamber 30C of the external electrode 30 It is what equips the upper part part and lower part part of a support ring Bb of this plastic envelope B with the infixation rings 12 and 13, respectively. [of regio-oralis B'] Since formation of the clearance between the internal surfaces of the external electrode 30 in regio-oralis B' in which the support ring Bb of plastic envelope B was formed can be prevented in addition to actuation of the manufacturing installation of drawing 10 , generating of the spots of the formed DLC film can be prevented more completely.
[0122] Drawing 12 shows the example of further others of the manufacturing installation of the carbon film coating plastic envelope by this invention. The configuration which body section 30A of the external electrode 30 is divided into two parts, upper part 30Aa and lower partial 30Ab, and electric insulating plate 30Ac is infixed between these two parts, and is insulated mutually, and the configuration of internal electrode 31 and others, And band-like copper plate 50A is [the peripheral face of lower partial 30Ab] the same as that of the manufacturing installation of drawing 8 about the point that band-like copper plate 50A' is rolled, to the peripheral face of upper part 30Aa again.
[0123] Matching box 50C of a piece is connected to copper plate 50A' wound around copper plate 50A wound around besides section partial 30Aa, and lower partial 30Ab through circuit-changing-switch 50B, and RF generator 50D of a piece is further connected to this matching box 50C.
[0124] Although the manufacturing installation of this drawing 12 forms the DLC film in the internal surface of plastic envelope B held in vacuum chamber 30C like the manufacturing installation of drawing 8 by supplying power to upper part 30Aa of the external electrode 30, and lower partial 30Ab, respectively At this time, the sequential injection of the power source supplied through matching box 50C from RF generator 50D is switched and carried out by circuit-changing-switch 50B at upper part 30Aa and lower partial 30Ab.
[0125] As for this manufacturing installation, a setup of the output power of matching box 50C is being fixed. When the output value of the power from this matching box 50C is fixed So that it may correspond to spacing of upper part 30Aa and the internal electrode [in / for the switching time of circuit-changing-switch 50B to lower partial 30Ab / each part] 31 (Lower part 30 spacing with an internal electrode 31 becomes shorter than the switching time over Ab about switching time [The short upper part 30] over Aa like) By setting up The DLC film of the same thickness as the internal surface of a part and the internal surface of a drum section which are applied to a shoulder from regio-oralis B' of plastic envelope B can be formed.
[0126] moreover, when the switching time of circuit-changing-switch 50B to upper part 30Aa and lower partial 30Ab is similarly set up By switching a setup of the output power of matching box 50C This matching box 50C to upper part 30Aa By the magnitude (direction which receives upper part 30Aa with short spacing with internal electrode 31 being [to lower partial 30Ab rather than] small) power corresponding to spacing with the internal electrode 31 in the part of lower partial 30Ab being made to be outputted The DLC film of the thickness same like the above as the internal surface of a part and the internal surface of a drum section which are applied to a shoulder from regio-oralis B' of plastic envelope B can be formed.
[0127] Although the DLC film is formed as mentioned above that there are no spots in the whole internal surface of plastic envelope B, since only necessary time amount can supply power to upper part 30Aa of the external electrode 30, and lower partial 30Ab with the RF generator of a piece, and the matching box of a piece, respectively, according to the manufacturing installation of this drawing 12 , cheap-ization of equipment can be attained further.

[0128] In addition, in the manufacturing installation of above-mentioned drawing 12 , the sequence of an injection of power is good even from upper pa[redacted]0Aa of the external electrode 30, and [redacted] of lower partial 30Ab.
[0129] Drawing 13 shows the examp[redacted] the manufacturing installation which [redacted]bined the infixation rings 12 and 13 used for the manufacturing installation of the carbon film coating plastic envelope of above-mentioned drawing 12 in the manufacturing installation of drawing 1 . By equipping the upper part part and lower part part of a support ring Bb of plastic envelope B with the infixation rings 12 and 13, respectively [of regio-oralis B'] The clearance formed between the peripheral faces of regio-oralis B' of plastic envelope B and the internal surfaces of the external electrode 30 in which the support ring Bb was formed is filled with the conductive matter, and in case the DLC film is formed, it is prevented more completely [that spots occur].
[0130] Although the above drawing 8 thru/or the manufacturing installation of the carbon film coating plastic envelope in each example of 13 are halving the external electrode 30 to upper part 30Aa and lower partial 30Ab, respectively When the plastic envelope which forms the DLC film is the thing of further the deformation by the thing of illustration By dividing the external electrode 30 according to the appearance of a plastic envelope beyond two piece housing, and switching on the power corresponding to spacing between the internal electrodes 31 in each part Deformation of the plastic envelope by the spots and heat of the DLC film which were formed can be prevented still more effectively.
[0131] Moreover, you may make it use drawing 6 and the infixation case 20 of 7 in each example of above-mentioned drawing 9 , and 11 and 13 instead of drawing 2 thru/or the infixation rings 12 and 13 of 5.

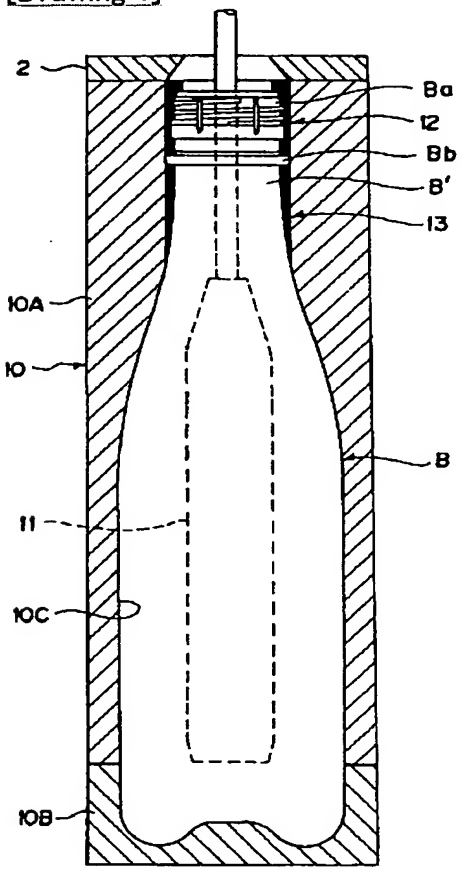
[Translation done.]

* NOTICES *

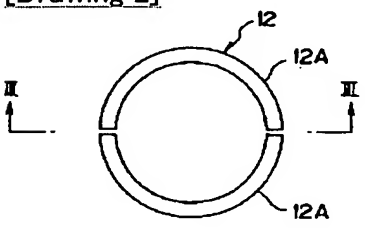
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

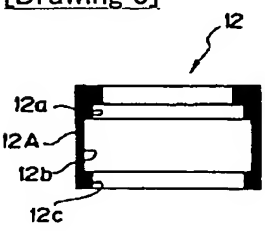
[Drawing 1]



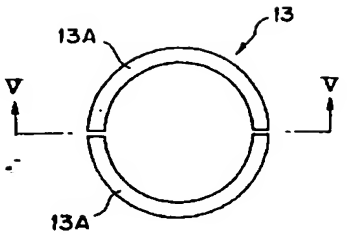
[Drawing 2]



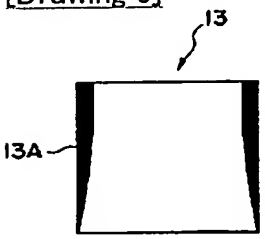
[Drawing 3]



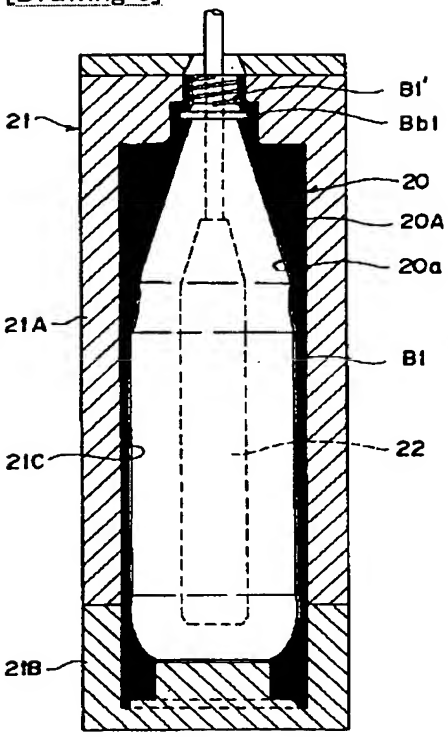
[Drawing 4]



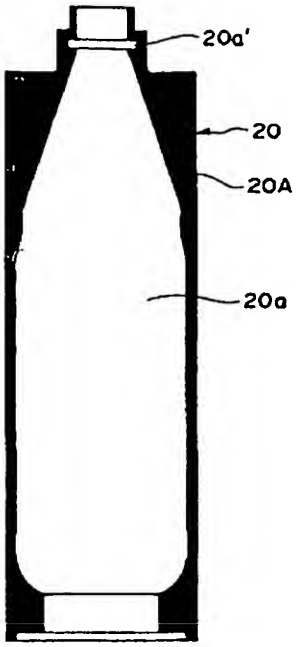
[Drawing 5]



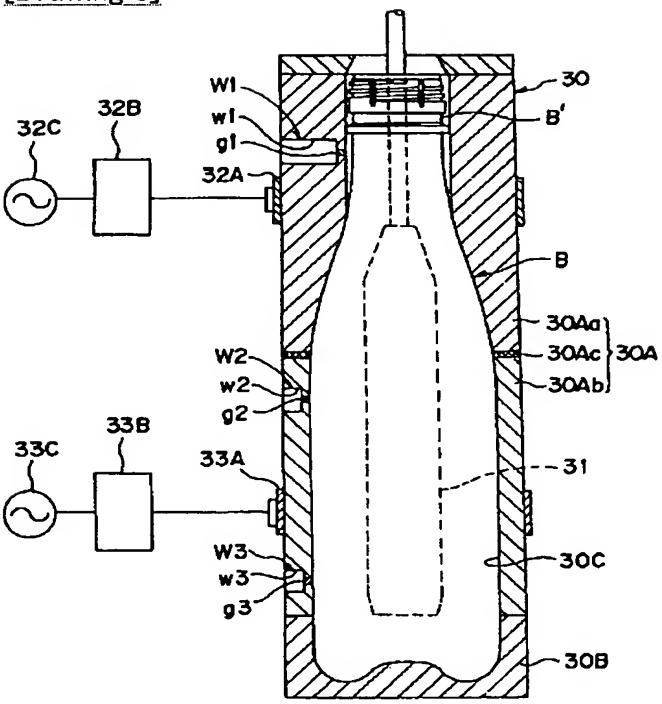
[Drawing 6]



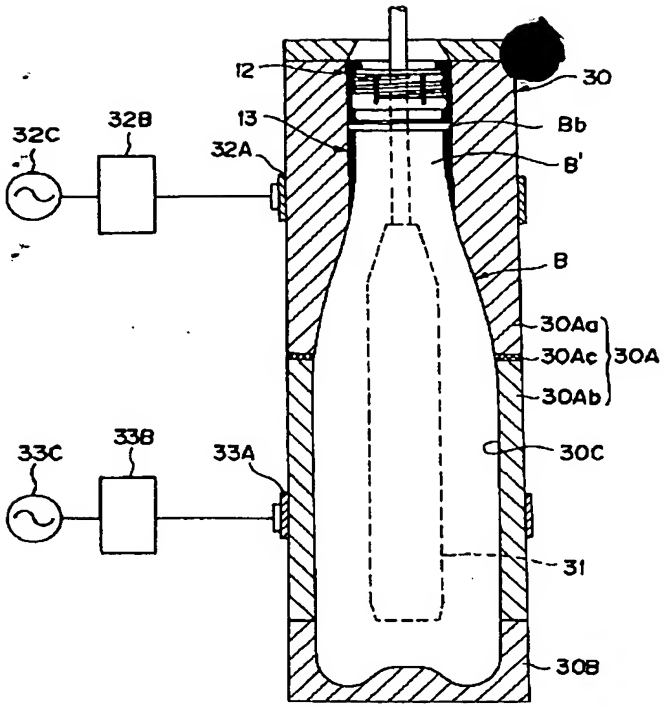
[Drawing 7]



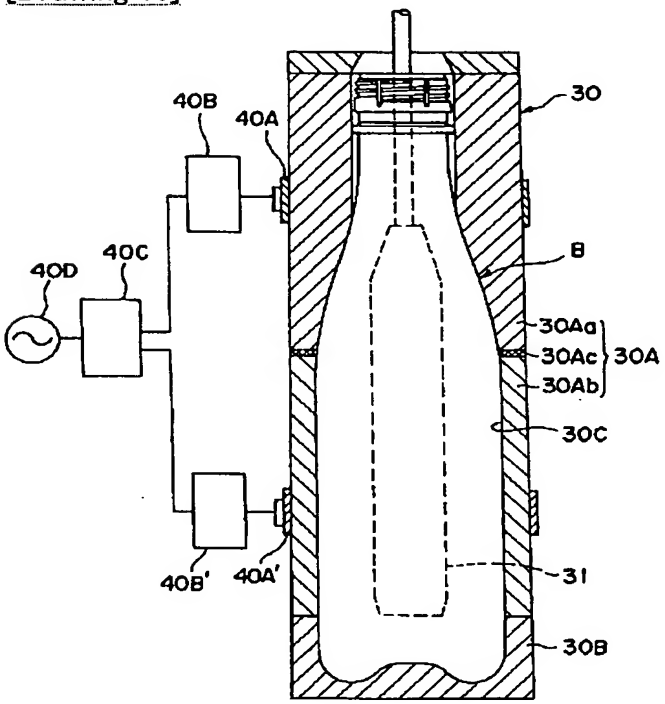
[Drawing 8]



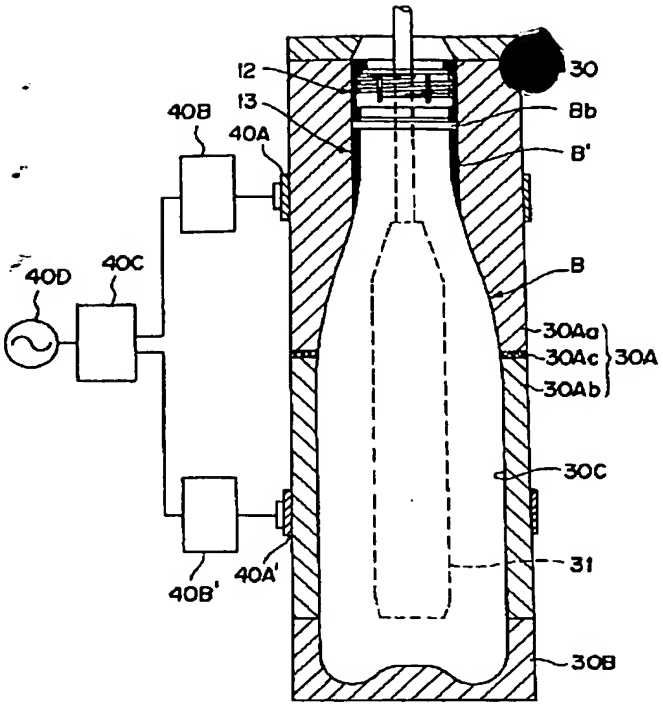
[Drawing 9]



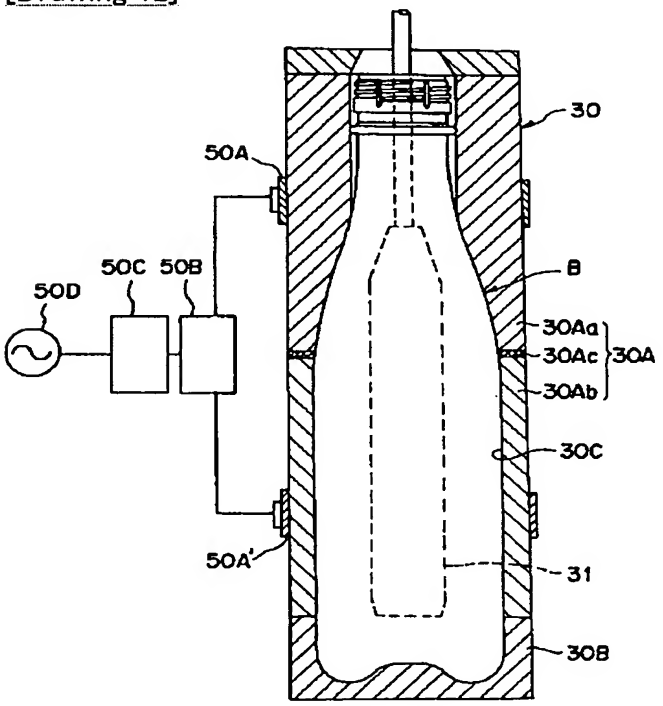
[Drawing 10]



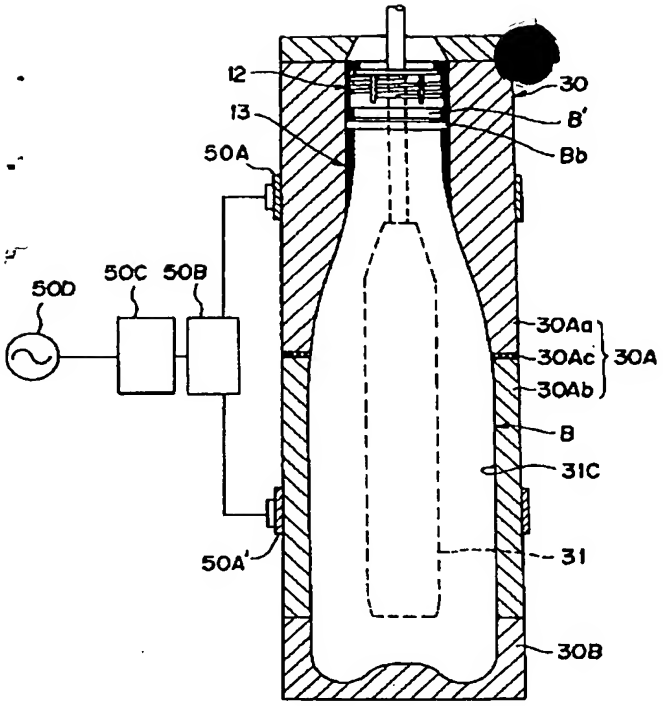
[Drawing 11]



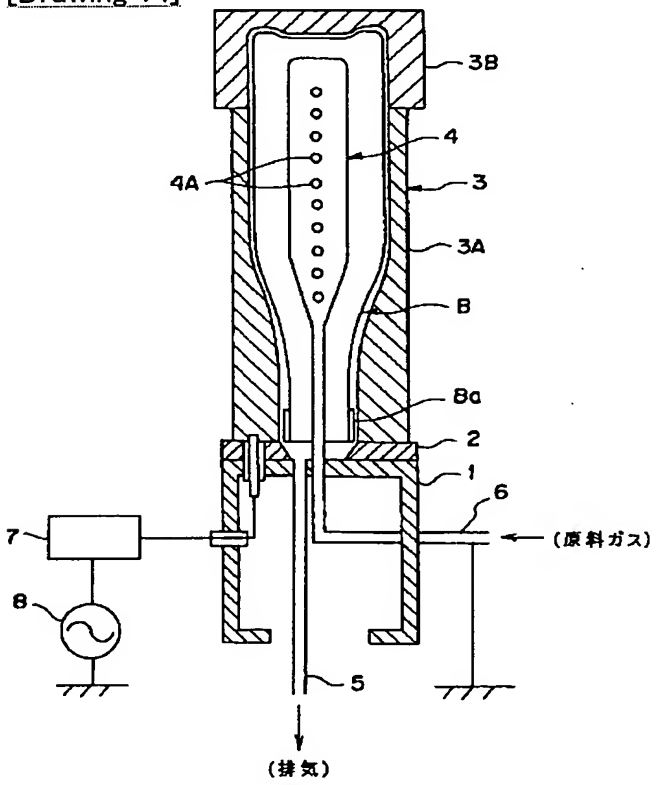
[Drawing 12]



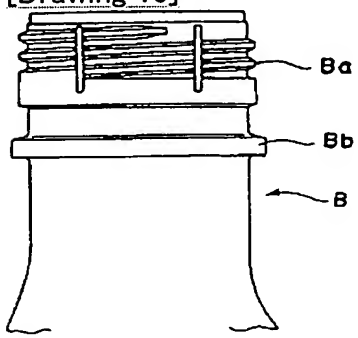
[Drawing 13]



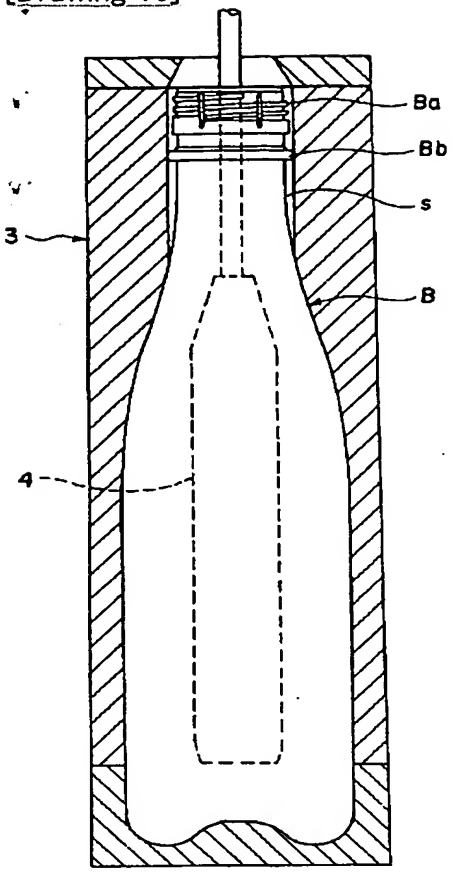
[Drawing 14]



[Drawing 15]



[Drawing 16]



[Translation done.]